299A

TUNNEL CONSTRUCTION

Our Leather Bound Engineers Note Books are carried in the following rulings:

No. 380 LEVEL BOOK. Left and Right Hand Page the same as Left Hand Page of this Book.

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No. 384 MINING TRANSIT BOOK. Left Hand Page as in this Book, Right Hand Page 8x8 to the inch, Center Line Red.

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THE FREDERICK POST CO.

ENGINEERING and DRAFTING SUPPLIES

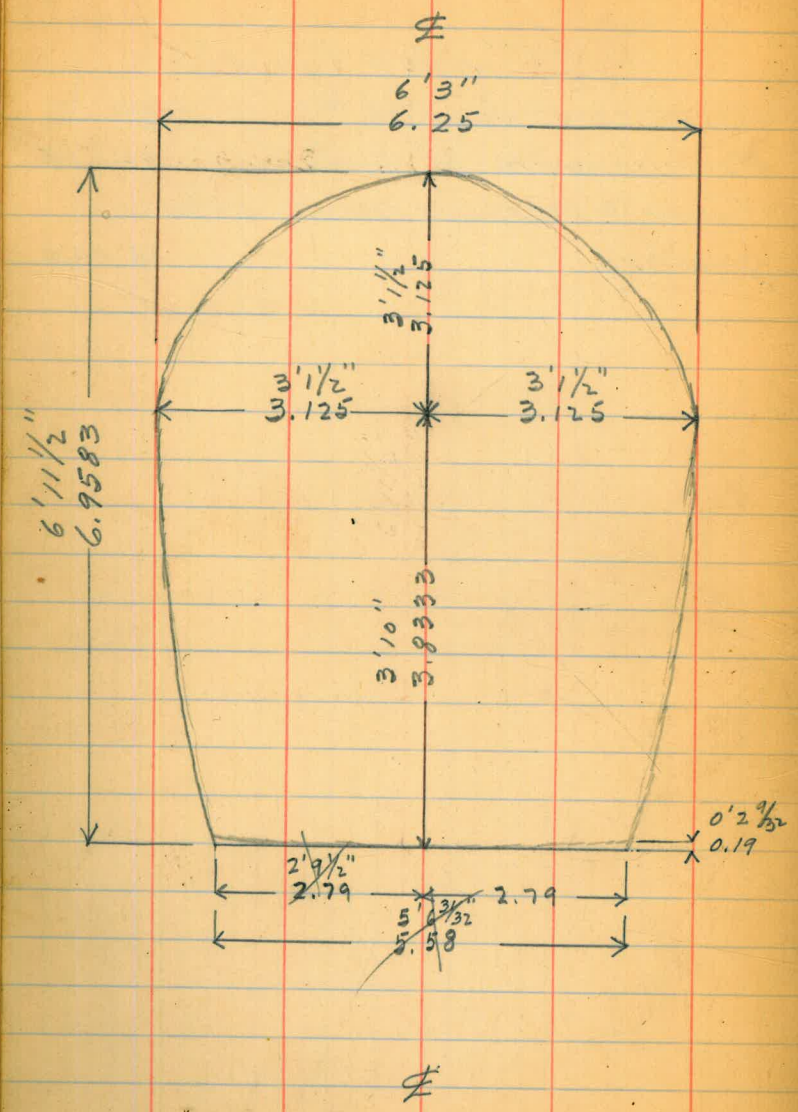
IRVING PARK STATION

CHICAGO, ILL.

Otay Reservoir San Diego 2nd Main Pipeline

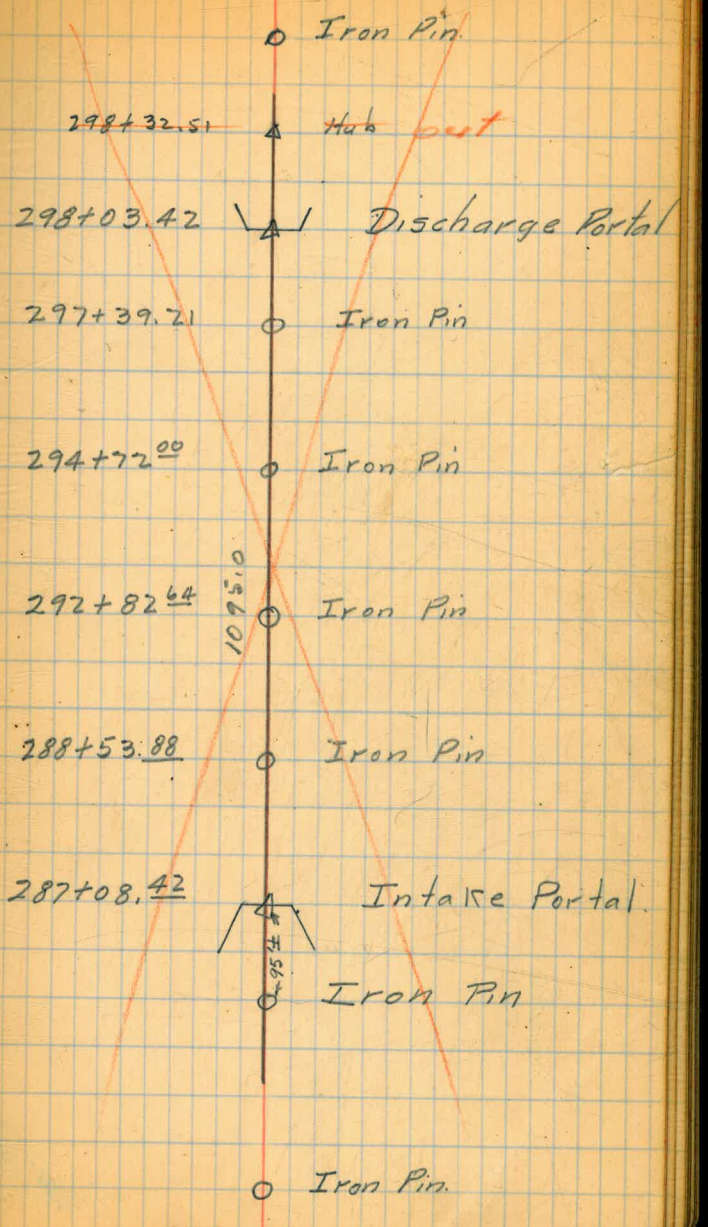
Index Tunnel 4

O.R.-S.D. 2nd. Main Pipe Line



Alignment - Tunnel #4.

②



Transferred to Notebook

#4

Sta.	Tunnel Excavation Grade Bottom	Tunnel Excavation Grade Top	Pipe Line Grade
287+08.42	385.797	392.755	386.88
+50	385.755	392.713	386.838
288	385.705	392.663	386.788
+50	385.655	392.613	386.738
289	385.605	392.563	386.688
+50	385.555	392.513	386.638

386.880
1.083
385.797
6.958
392.755

386.838
1.083
385.755
6.958
392.713

(Mar 7 1930)
Iron Pipe 287+30.00
⊙ B.M. top pipe Elev. 385.86
(Mar 10 1930)

(Mar 7 1930)
Iron Pipe 288+30.00
⊙ B.M. top pipe 385.63½
(Mar 10 1930)

Transferred to new work
M.D.S.
Mar 16 1930

#4

Sta.	Tunnel Excavation Grade Bottom	Tunnel Excavation Grade Top	Pipe Line Grade.
290	385.505	392.463	386.588
+50	385.455	392.413	386.538
291	385.405	392.363	386.488
+50	385.355	392.313	386.438
292	385.305	392.263	386.388
+50	385.255	392.213	386.338

#4

Sta.	Tunnel Excavation Bottom	Grade Top	Pipe Line Grade
293	385.205	392.163	386.288
+50	385.155	392.113	386.238
294	385.105	392.063	386.188
+50	385.055	392.013	386.138
295	385.005	391.963	386.088
+50	384.955	391.913	386.038
296	384.905	391.863	385.988
+50	384.855	391.813	385.938

(Mar 7 1930)

⊙ Iron pin 295+90 05

B.M. to pin Elev 384.74

#4

Sta.	Tunnel Excavation Bottom	Grade Top	Pipe Line Grade
297	384.805	391.763	385.888
+50	384.755	391.713	385.838
298	384.705	391.663	385.788
+03.42	384.702	391.660	385.785

384.702 + 6.958 = 391.660

384.705 + 6.958 = 391.663

(Reset TK. Mar 7 1930)

297+00.00

⊙ 1" iron pipe wood plug & tk.
B.M. top of pin El. 384.95

(Feb 18 1930)

Sta 298+20.00

⊙ 1" iron pipe wood plug & tk.
B.M. top of pin Elev 385.70
(Feb 27 1930)

Timbered Sections - Tunnel #4.
Monthly Estimate to 3 P.M. Feb. 26. 1930
Discharge Portal.

Sta.	Sill 4"x6"x6'11"	Post 4"x6"x5'3"	Cap Pcs. 4"x6"x2'8½"	Lagging 2"x10"	Lagging 2"x12"
297+47 3	1	2	3		
4.0				2	1
297+43.2	1	2	3		
				1	2
297+39.1	1	2	3		
				1	2
297+35	1	2	3		
				1	2
+31	1	2	3		
				3	6
+27	1	2	3		
				3	6
+22.8	1	2	3		
				3	6

Mch.

Board Measure

4×6	2×10	2×12
51.08		
	13.36	8.0
51.08		
	6.68	16.0
51.08		
	6.68	16.0
51.08		
	6.68	16.0
51.08		
	20.04	48.0
51.08		
	20.04	48.0
51.08		
	20.04	48.0
357.56	93.52	200.0

	Sill	Post		Lagging 2X10	Lagging 2X12
297+18.8	1	2	3		
				3	6
+14.7	1	2	3		
4.0				3	6
+10.6	1	2	3		
5.0				2	4
+05.5	1	2	3		
				2	4
297+00.4	1	2	3		
				3	6
296+95.6	1	2	3		
5.0				4	5
+90.6	1	2	3		
4.5				3	5
+85.9	1	2	3		
4.5				3	4

Board Measure

4X6	2X10	2X12
357.56	93.52	200.0
51.08		
	20.04	48.0
51.08		
	20.04	48.0
51.08		
	16.70	40.0
51.08		
	16.70	40.0
51.08		
	25.05	60.0
51.08		
	33.40	50.0
51.08		
	22.55	45.0
51.08		
	22.55	36.0
766.20	270.55	567.0

	5:11	Post		Lagging 2X10X	Lagging 2X12X
296 +81.4	1	2	3		
				3.	6
+76.8	1	2	3		
				3	6
+72	1	2	3		
				3	6
+67.5	1	2	3		
				3	6
+63	1	2	3		
				3	6
+58.5	1	2	3		

To 3 P.M. Feb. 26. 1930 —

Board Measure

4X6	2X10	2X12
766.20	270.55	567.0
51.08		
	22.55	54.0
51.08		
868.36	293.10	621.00
	22.55	54.0
51.08		
	22.55	54.0
51.08		
	22.55	54.0
51.08		
	22.55	54.0
51.08		

1072.68 - 381.30 - 837.0

297 + 473
296 + 58
100

Feb. Estimates

868.36
293.10
621.00
1782.46

1072.68
381.30
837.00
2290.98

Est. #1. 2291.0

Timbered Sections. Tunnel #4
Monthly Estimate to 3 P.M. 2/26/30
Entrance Portal.

Sta.	Sill	Posts.	1/4 Braces Crown Strut	Lagging 2 X 10	Lagging 2 X 12
287+10	1	2	3		
				3	6
+14	1	2	3		
				3	6
+18	1	2	3		
				3	6
+22	1	2	3		
				3	6
+26	1	2	3		
				3	6
+30	1	2	3		
				3	6.
+34	1	2	3		

To 3rd P.M. Feb. 26. 1930 –

Board Measure

4X6	2X10	2X12
51.08		
	20.04	48.0
51.08		
	20.04	48.0
51.08		
	20.04	48.0
51.08		
	20.04	48.0
51.08		
	20.04	48.0
51.08		
	20.04	48.0
51.08		
357.56	120.24	288.0

357.56
120.24
288.00
765.80

Estimate #1-766.0

Otay Res. to San Diego 2nd
Timber Measure

June 18, 1930
Cloudy-Cool

Sta	Lt. Post	Lt. Cap	Center Cap	Rt. Cap	Rt. Post
287+08.5	4 x 6 1/4	4 x 6 1/4	4 x 6	4 x 6	4 1/8 x 6 1/8
+10.5	4 x 6	3 3/4 x 6	4 x 6	3 3/4 x 5 5/8	4 x 6
+15.0	4 x 5 7/8	3 3/4 x 6	4 x 6	4 x 5 7/8	4 x 6
+19.5	4 x 6	4 x 5 7/8	4 x 6	4 x 6	4 x 6
+24.5	4 x 5 7/8	4 x 6	4 x 6	4 x 6	4 x 5 7/8
+29	3 3/4 x 5 7/8	4 x 6 1/8	4 x 6	4 x 6	4 x 5 7/8
+33.5	4 x 5 7/8	4 1/8 x 5 7/8	4 1/8 x 6 1/4	4 x 5 7/8	4 x 6
+38	4 x 6	3 7/8 x 6	3 7/8 x 6	4 1/4 x 5 7/8	4 x 6
+42.5	4 x 5 7/8	3 7/8 x 5 7/8	4 x 5 7/8	4 x 5 7/8	4 x 6
+47	4 1/4 x 6	4 x 5 7/8	4 1/4 x 6	4 1/4 x 6 1/8	4 x 6 1/8
+51.5	4 1/4 x 5 7/8	4 1/4 x 6	4 1/4 x 5 7/8	4 1/2 x 6 3/8	4 1/8 x 6

Main Pipe Line
Tunnel #4

Elliott - Notes
Jacobszon - Ruler
Bailey - Ruler.

Sta.	Lt. Post	Lt. Cap	Center Cap	Rt. Cap	Rt. Post
287+56	4 x 6	4 3/4 x 6 1/4	4 1/4 x 5 7/8	4 1/8 x 5 3/4	4 1/8 6 1/8
+60 5	3 7/8 x 6	4 x 6	4 1/8 x 5 3/4	4 1/8 x 5 3/4	3 3/4 x 5 3/4
+61 5	4 x 5 7/8	4 1/4 x 5 7/8	4 3/4 x 6 1/4	4 x 6	4 1/4 x 5 7/8
+65 5	4 1/8 x 6	4 x 6	4 1/4 x 5 7/8	4 1/8 x 6	4 1/8 x 6
+70	4 x 6	4 x 6	4 1/8 x 6	4 1/4 x 6 1/4	4 x 5 1/2
+74 5	4 x 5 3/4	4 1/8 x 5 7/8	4 1/8 x 6	4 1/8 x 6	4 1/8 x 6
+79	4 x 6	4 x 6	4 1/2 x 6	4 1/8 x 6	4 x 6
+84	4 1/8 x 6	4 x 6	4 x 5 7/8	4 x 5 3/4	4 x 6
+88 5	4 x 6 1/8	4 1/4 x 5 7/8	4 1/4 x 5 7/8	4 1/8 x 5 7/8	4 x 6
+92 5	4 x 5 7/8	4 x 5 7/8	4 1/8 x 6 1/8	4 1/8 x 6	4 1/8 x 5 7/8
+97 5	4 1/8 x 6 1/8	4 x 5 7/8	4 1/8 x 6	4 x 5 7/8	4 1/4 x 5 5/8
288 +02	4 3/8 x 6	4 1/8 x 6	4 1/4 x 5 1/2	4 1/8 x 5 7/8	3 7/8 x 5 7/8
+06 5	3 7/8 x 6 1/8	4 x 6	4 x 6	4 1/8 x 5 5/8	4 x 6

Sta.	Lt. Post	Lt. Cap	Center Cap	Rt. Cap	Rt. Post
288+11	4×6	4×5 7/8	4×6	4×6	4 1/8×5 7/8
+15.5	4 1/8×6	4 1/8×5 7/8	4×6	4×5 3/4	4 1/2×6 3/8
+20	4 1/4×6 1/8	4 1/4×6 1/8	4 1/4×5 7/8	4 1/4×6 1/8	4 1/8×6
+24.5	4 1/8×5 7/8	4×6 1/4	4×5 7/8	4 1/8×5 7/8	4 1/4×5 7/8
+29	4 1/2×6 1/2	4×6	4×6	3 7/8×5 7/8	4×5 3/4
+33.5	4×5 7/8	4×6	4×5 7/8	4×5 7/8	4×5 7/8
+38	4×5 7/8	4 1/4×6 1/8	4×5 7/8	4 1/8×5 7/8	4×6 1/8
+42.5	4×5 7/8	4 1/4×5 7/8	4 1/8×6	4×6	4 1/8×6
+47	4×6 1/8	4×6	4 1/4×6	4×6	4×6
+51.5	4 1/4×6 1/8	4×6	4×6	4×6	4×6 1/8
+56	4×6	4 1/8×5 7/8	4×6 1/8	4 1/8×6	4×5 7/8
+61	4 1/8×6	4 1/8×6	4 1/4×5 7/8	4×6	4 1/4×6 1/2

Sta	Lt. Post	Lt. Cap	Center	Rt. Cap	Rt Post
288+65.5	4×6	4 1/4 × 5 7/8	4 1/8 × 5 7/8	4×6	4×6
+70	4×6 1/8	4×5 7/8	4 1/4 × 5 7/8	4 1/8 6 1/4	4×5 7/8
+74.5	4×5 3/4	4×6 1/8	4 1/8 × 5 7/8	4 1/8 × 6	4×5 7/8
+79	4×6 1/4	4×5 7/8	3 7/8 × 6	4×6 1/8	3 3/4 × 6
+83.5	4×6	4 1/4 × 6	4 1/8 × 6	4×6	4×6 1/8
+88.5	4×6	4 1/8 × 5 7/8	4 1/8 × 6	3 3/4 × 6	4×6
+93	4 1/8 × 6 1/8	4×5 7/8	4×6	4×5 7/8	4×6
+97.5	4×6	4×5 7/8	4 1/4 × 6 1/4	4×5 3/4	4×6 1/8
289+02	4×6	4×6	4 1/4 × 6	4×5 7/8	4×6
+06.5	4 1/8 × 6 1/4	4 1/8 × 5 3/4	4×6	4×6	4 1/8 × 6 1/4
+11	4×6	4×6	4×6	3 3/4 × 6	4×6
+15.5	4×6 1/8	4×6 1/8	4×6	4×6 1/4	4 1/4 × 6 1/4

Sta	Lt. Post	Lt. Cap	Center	Rt. Cap	Rt. Post
289+20	4X6	4x5 7/8	4 1/4 x 6 1/8	4X6	4X6
+29.5	4X6	4X6	4 3/8 X 6	4X6	4 1/4 X 6 1/8
+29	4 1/8 X 5 7/8	4X6	4 1/4 X 6	4 1/4 X 5 3/4	4 1/8 X 5 1/2
+33.5	4X6 1/8	4 1/4 X 6	4 1/8 X 6	4X6	4 X 6 1/8
+38	4 1/4 X 6	4 1/4 X 6	4 1/4 X 6	4 X 6	4 1/8 X 6
+42.5	4 1/4 X 6	4 1/8 X 6	4 1/8 X 6	4 1/4 X 5 3/4	3 3/4 X 5 3/4
+47	4X6 1/8	4X6	4X6	4X5 7/8	4X6
+52	4X6	4X5 7/8	4 1/4 X 5 7/8	4 1/4 X 6 1/4	4 1/8 X 6
+56.5	4X6	4X5 7/8	4X6	3 7/8 X 6 1/4	4X6
+61	3 3/4 X 6	4X5 7/8	4 1/8 X 6	4 1/4 X 6 1/8	3 3/4 X 5 7/8
+65.5	3 7/8 X 6	4 1/8 X 5 7/8	4 1/4 X 5 7/8	4 1/8 X 6	4 1/8 X 6
+70	3 7/8 X 6	4 1/8 X 6	4 1/8 X 6	3 7/8 X 5 7/8	4 1/8 X 6

Sta.	Lt. Post	Lt. Cap	Center	Rt. Cap	Rt. Post
289+79.5	4 1/4 x 6	4 x 6	4 1/4 x 6	3 7/8 x 5 3/4	4 1/8 x 5 3/4
+79	4 x 5 7/8	4 x 5 7/8	4 1/4 x 6	4 1/8 x 6	4 x 6
+83.5	4 1/4 x 6	3 3/4 x 6	3 7/8 x 6 1/8	3 7/8 x 6	4 1/8 x 6
+88	3 7/8 x 6	4 x 5 7/8	4 1/4 x 6	4 x 6	3 7/8 x 6
+92.5	4 1/4 x 5 7/8	4 1/8 x 6 1/8	4 1/4 x 6 1/8	4 1/4 x 5 7/8	4 1/4 x 5 7/8
+97	4 3/4 x 6 1/4	4 1/8 x 6	4 1/8 x 6	4 1/4 x 6	4 1/4 x 5 7/8

Av. = $4\frac{1}{10}'' \times 5\frac{15}{16}''$

Average sizes of 66 posts
$= 4\frac{1}{20}'' \times 6\frac{1}{128}''$

Av. $= 4\frac{1}{16}'' \times 5\frac{32}{33}''$

Av. $= 4\frac{3}{32}'' \times 5\frac{43}{44}''$

Av. $= 4\frac{1}{19}'' \times 5\frac{24}{25}''$

Av. $= 4\frac{1}{10}'' \times 5\frac{32}{33}''$

Tunnel 4. Measurements at Spring Line of Completed Gunited Timber Section where first and second thicknesses of gunite were placed before 6" mesh was installed

June 5, 1930 19
Converse
Conor.

Sta. 298 —	5'7"
297+95	5'7½
+90	5'8"
+85	5'7¾"
+80	5'8¼
+75	5'7½
+70	5'8"
+65	5'8½"
+60	5'9"
297+55	5'8½"

Average clearance at spring line = 5'8"

Tunnel 4 - Measurements at Spring Line of Completed Gunited Timber Sections where 6" mesh was installed before gunite operations but using nails set by templet in 4"x6" timber sets as guide for gunite operations.

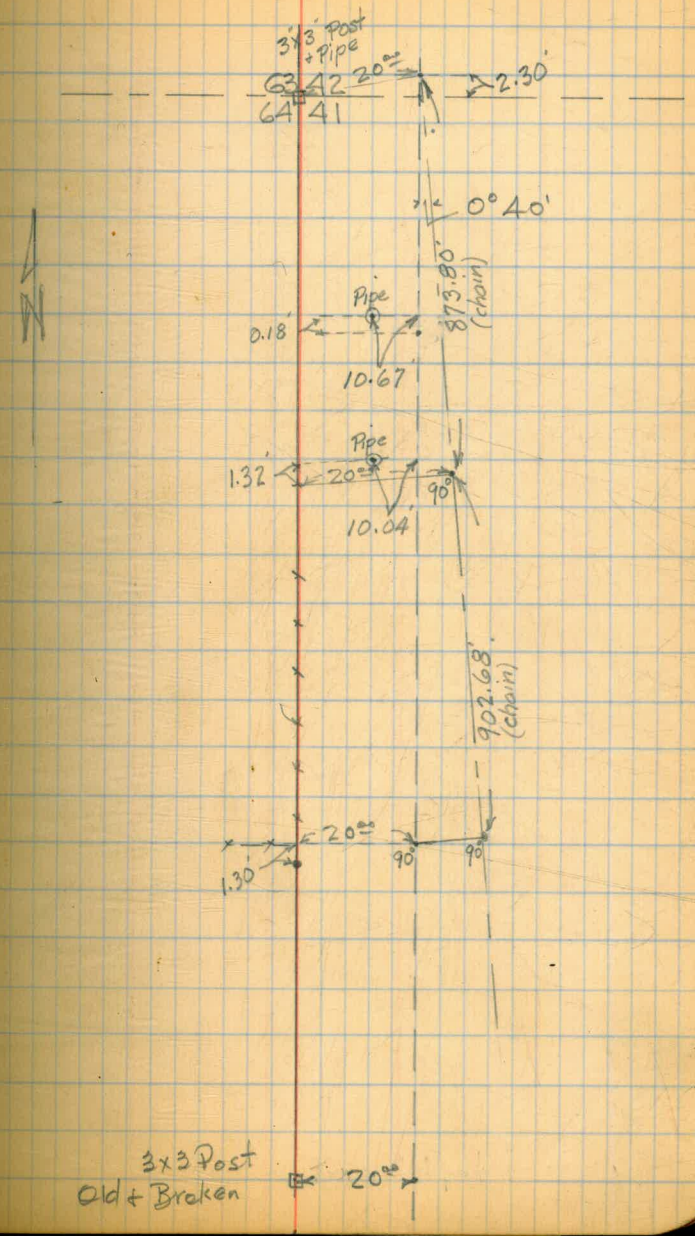
297+50	5'10"
+45	5'11"
+40	5'10½"
+35	5'10½"
+30	5'10"
+25	5'11⅛"
+20	5'10½"
+15	5'11⅛"
+10	6'0"
+05	6'¼"
297+00	5'11½"

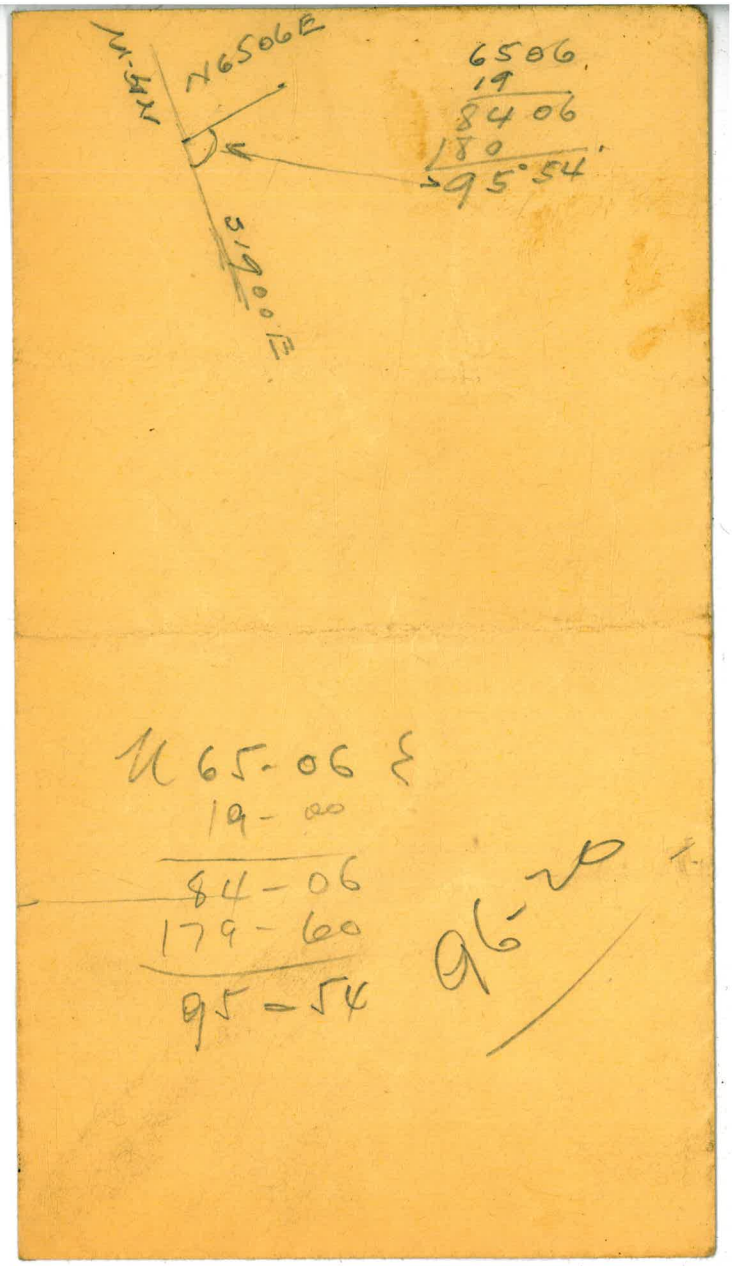
Average clearance at Spring Line = 5'11⅛"

Survey of
TELEGRAPH CANYON PROPERTY

Wueste
Coote
Osborne
1/25/38

— Easterly Property Line —





N 65-06 E
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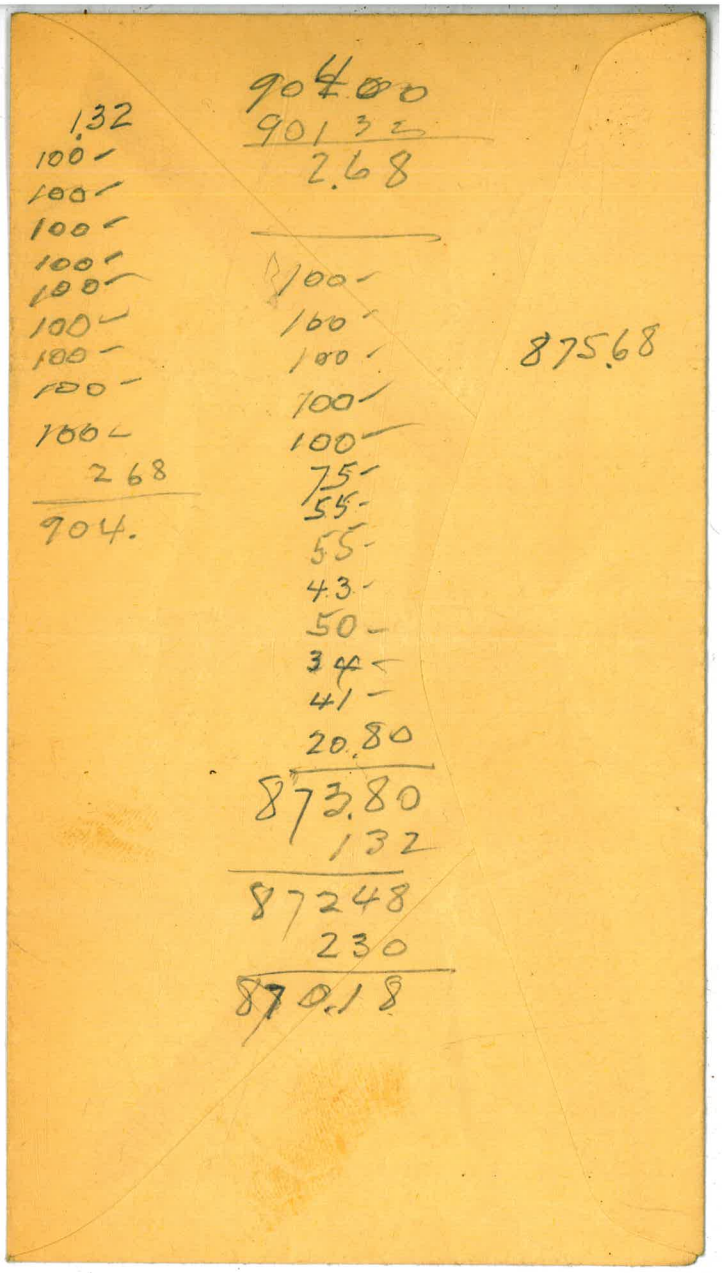
96-W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Mar 14 1930 Tunnel #4

Converse
Hill
Elliott notes
Simpson

B.M.			385.64
	5.20	390.84	
288+84		+1.74	392.58
+93		+1.73	392.57
289+02		+1.72	392.56
289+11		+1.71	392.55
289+20		+1.70	392.54
289+29		+1.69	392.53
289+38		+1.68½	392.52½
289+47		6.96 +1.67½	392.51½
		− 5.28½	

Transferred to new book

Mar 14 1930 Tunnel #4

Converse
Hill
Elliott
Simpson

B.M.				384.74
	5.22	389.96		
295+05			+2.00	391.96
294+96			+2.01	391.97
294+87			+2.02	391.98
294+78			+2.02	391.98
294+69			+2.03	391.99
294+60			+2.04	392.00
294+51			+2.05	392.01
294+42			+2.06	392.02
			-4.90	

	390.04		
287 +84		+2.64	392.68
		+4.32	
+93		+2.63	392.67
		-4.33	
288 +02		+2.62	392.66
+12		+2.61	392.65
+20		+2.60	392.64
+29		+2.59	392.63
+38		+2.58	392.62
+47		+2.57	392.61
+56		+2.56	392.60
		-4.40	
+65		+2.55	392.59

Transferred to new book

+74		+2.55	392.59
		-4.41	
+84		+2.54	392.58
		-4.42	

Mar 10 1930

Converse
Hill
Elliott
Simpson

B.M. #54				395.18
	2.31½	397.49½		
Set B.M.			4.03½	393.46
T.P.			4.93	392.56½
	0.45½	393.02		
T.P			5.94½	387.07½
	3.03	390.10½		
Set B.M.			4.24½	385.86
Set B.M.			4.47	385.63½
	4.41	390.04		
287+20			+2.70	392.74
+29			+2.69	392.73
+38			+2.68	392.72
			-1.28	
+47			+2.67	392.71
+56			+2.66	392.70
+65			+2.65	392.69
+75			+2.64	392.68

Transferred to new book

S.W. Cor Concrete Cap S. Portal Old Tunnel

Iron pin 287+30
" " 288+30

Mar 10 1930.

Converse
Hill
Elliott notes
Simpson

B.M.				384.95
	4.71	389.66		
295 +55			+ 2.26	391.91
295 + 50			+ 2.25	391.91
295 + 50			- 4.71	384.95
295 + 40			+ 2.26	391.92
295 + 40			- 4.70	384.96
295 + 31			+ 2.27	391.93
295 + 31			- 4.69	384.97
295 + 23			+ 2.28	391.94
295 + 23			- 4.68	384.98
295 + 14			+ 2.29	391.95
295 + 14			- 4.67	384.99
295 + 05			+ 2.30	391.96
295 + 05			- 4.66	385.00
295 + 00			+ 2.30	391.96
295 + 00			- 4.66	385.00

Transferred to new book

Pin 297 + 00

Mar 7 1930 Tunnel 74

Converse
Hill
Elliott
Simpson

B.M.			385.70		Iron pin 298+20
	3.71	389.41			
B.M.			4.46	384.95	" " 297+00
	4.46	389.41			
Set B.M.			4.67	384.74	" " 295+90.05
	4.67	389.41			
295+42			− 4.45	384.96	Bottom
+42			+2.51	391.92	Top
+50			− 4.46	384.95	Bottom
+50			+2.50	391.91	Top
+59			− 4.47	384.94	Bottom
+59			+2.49	391.90	Top
295 +73			− 4.48	384.93	Bottom
+73			+2.48	391.89	Top
B.M.				393.44	
Transferred to new book					
	M.A.E	398.04	7.14	387.90	
	2.06	389.96			
Set B.M			4.12	385.84	Top of pin 287+30
Set B.M.			4.34	385.62	" " " 288+30
288+29			+2.67	392.63	Top
288+38			+2.66	392.62	Top
288+38			− 4.30	385.66	Bottom
288+48			+2.65	392.61	Top
" "			− .431	385.65	Bottom

Mar. 6, 1930 — Tunnel 7 — Converse, Hill, Elliott Notes, Simpson

B.M.				393.44	
	1.39	394.83			
			7.54	387.29	
	2.08	389.37			
288+12			- 3.68	385.69	Bottom
+12			+ 3.28	392.65	Top
+20			- 3.69	385.68	Bottom
+20			+ 3.27	392.64	Top
+30			- 3.70	385.67	Bottom
288 +30			+ 3.26	392.63	Top
B.M.				384.95	
	4.40	389.35			
295+73			+ 2.54	391.89	Top
295+73			- 4.42	384.93	Bottom
295+64			+ 2.55	391.90	Top
295+64			- 4.41	384.94	Bottom

Transferred to new book

W. D. E.

Mar. 5, 1930 — Tunnel #4 — Hill, Elliott notes, Simpson

B.M.				384.95	
	3.67	388.62			
296 +00			+3.24	391.86	Top
296+10			+3.23	391.85	Top
295+82			+3.26	391.88	Top
295+75			-3.69	384.93	Bottom

Mar 5

B.M.	0.93	394.37		393.44	
T.P.			6.38	387.99	
	2.98	390.97			
287+38			+ 1.76	392.73	Top
+47			+ 1.75	392.72	"
+60			+ 1.73	392.70	"
+65			+ 1.73	392.70	"
+75			+ 1.72	392.69	"
+84			+ 1.71	392.68	"
+93			+ 1.70	392.67	"
288+02			+ 1.69	392.66	Top
+02			- 5.27	385.70	Bottom
+12			- 5.28	385.69	"

Transferred to new book

W. D. S.

Top of Pin 297+00

Set Red Heads to Line & Grade

Feb 27 1930

Converse
H. II
Elliott T nates
Simpson 9

B.M.			394.50	
	0.16½	394.66½		
T.P.			10.69	383.97½
	5.06	389.03½		
Set B.M.			4.45½	384.58
Set B.M. T.P.			3.33½	385.70
	2.65	388.35		
Set B.M.			3.40	384.95

Mar 3 1930

B.M.	3.01	388.71		385.70
296+10	Bottom	384.90		− 3.81
296+20	Top	391.84		+3.13
+30	Top			+ 3.12
+90				+ 3.11
+50				+ 3.10

Transferred to new book

Mar 3 1930

B.M.	0.99	394.43		393.44
T.P.			6.44	387.99
	1.85	389.84		
287+60		292.70		+ 2.86
288+00		385.70		− 4.14

Rt of 298+80 (Iron Pin)
Top of P.O.T. pin 298+20

" " " " 297+00

Feb 20, 1930.

				Rod
B.M.	8.79	389.29	380.50	
298+00		391.67		+2.38
+90		391.68		+2.39
+80		391,69		+2,90
+70		391.70		+2.91
+60		391.71		+2.92
297 +50		391.72		+2,93

Feb 27, 1930 Converse, Hill, Elliott, Simpson

Notes.

B.M	8.31	388.81	380.50	Rod
296+50		384.85 Bottom		3.96
		391.80 Top		+2.99

B.M.			384.95	
	3.40	388.35		Rod
296+81		391.78		+3.43
+73		391.79		+3.44
+63		391,80		+3.45
+55		391.81		+3.46
+46		391.82		+3.47

Transferred to new book

B.M. 380.500

5.075 385.575

B.M. 0.995 384.580

Top of pin 297+00

Discharge # 4 — Feb 20, 1930

Converse
Hill
Elliott
Simpson

B.M. — Grade Rod. 380.50

9.08 389.58

Sta.	Grade
298	384.713
297+60	384.753
+50	384.763
+30	384.783

4.87
4.83
Set → 4.82
Set → 4.80

Converse
Hill
Elliott

Feb 24 1930

B.M. 380.50 Rod

9.08 389.58

Grade

	Top	Bottom	
297+00	391.763	384.805	- 4.775
296+90			+ 2.183
297+10			+ 2.193
+20			+ 2.173
+30			+ 2.163
+40			+ 2.153
			+ 2.143

Transferred to New Book

.03.42
1
.00342

385.793
1.083
384.710
6.958
391.668

DIRECTIONS FOR USE OF TABLES

TABLE No. 1.

Distance of slope stake from side or shoulder stake for any width roadway, slope 1½ to 1. If ground is nearly level, the cut or fill at side stake is located by the double entry method in left column and top row. The number in body of table in same row and column gives distance from side stake to slope stake. If ground is not level estimate the difference in elevation between the side stake and slope stake, lower target by this amount if cut, elevate if fill. Add this amount to cut or fill and find distance in table. Set up rod at this point, and line of sight should cut target. If it does not make the slight adjustment necessary.

TABLE No. 9.

To find Tangent and External for curve of any other degree, divide by degree of curve and add correction found in column of corrections.

Degree of curve with a given I may be found by dividing tangent, (or external), opposite I by given tangent, (or external).

The distance from a point on the tangent to the curve is very nearly the square of the tangent length divided by twice the radius.

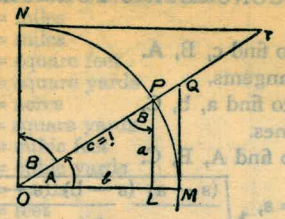


TABLE II

TRIGONOMETRIC FORMULÆ.

$\angle A = \angle MOP \qquad \angle B = \angle PON = \angle OPL$

$R = OB = c = 1$

$$\sin A = \frac{a}{c} = \frac{a}{1} = a = \cos B = LP$$

$$\cos A = \frac{b}{c} = \frac{b}{1} = b = \sin B = OL$$

$$\tan A = \frac{a}{b} = \frac{MQ}{OM} = \frac{MQ}{1} = MQ = \cot B = MQ$$

$$\cot A = \frac{NT}{ON} = \frac{NT}{1} = NT = \tan B = NT$$

$$\sec A = \frac{OQ}{OM} = \frac{OQ}{1} = OQ = \csc B = OQ$$

$$\csc A = \frac{OT}{ON} = \frac{OT}{1} = OT = \sec B = OT$$

$$\text{vers } A = \frac{LM}{OP} = LM = \text{covers } B \#$$

$$\text{covers } A = \frac{OP - LP}{OP} = OP - LP = \text{vers } B$$

$$\text{exsec } A = PQ = \text{coexsec } B$$

$$\text{coexsec } A = PT = \text{exsec } B$$

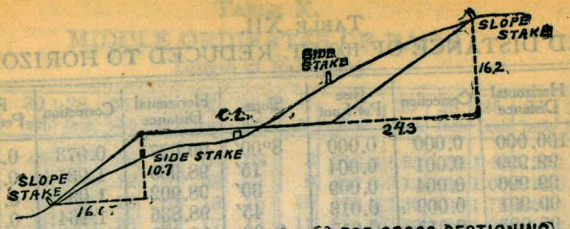
$$\sin \tfrac{1}{2} A = \sqrt{\frac{1 - \cos A}{2}} \qquad \cos \tfrac{1}{2} A = \sqrt{\frac{1 + \cos A}{2}}$$

$$\sin 2A = 2 \sin A \cos A \qquad \cos 2A = \cos^2 A - \sin^2 A$$

Law of Sines $\dfrac{\sin A}{a} = \dfrac{\sin B}{B} = \dfrac{\sin C}{C}$

Law of Cosines $c^2 = a^2 + b^2 - 2ab \cos C$

Law of Tangents $\dfrac{a+b}{a-b} = \dfrac{\tan \frac{1}{2}(A+B)}{\tan \frac{1}{2}(A-B)}$



DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING.

SLOPE 1½ TO 1. ROADWAY OF ANY WIDTH.

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	0 00	0 15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	0
1	1.50	1 65	1 80	1.95	2.10	2.25	2.40	2.55	2.70	2.85	1
2	3.00	3.15	3.30	3 45	3.60	3 75	3.90	4.05	4.20	4 35	2
3	4.50	4 65	4.80	4.95	5 10	5 25	5 40	5.55	5.70	5.85	3
4	6.00	6 15	6.30	6.45	6.60	6.75	6.90	7.05	7.20	7.35	4
5	7 50	7.65	7.80	7.95	8.10	8.25	8.40	8.55	8.70	8.85	5
6	9 00	9 15	9.30	9.45	9.60	9.75	9.90	10.05	10.20	10.35	6
7	10.50	10 65	10.80	10.95	11.10	11.25	11.40	11.55	11 70	11.85	7
8	12.00	12 15	12.30	12.45	12.60	12.75	12.90	13.05	13.20	13.35	8
9	13 50	13 65	13 80	13 95	14.10	14.25	14.40	14 55	14.70	14.85	9
10	15.00	15 15	15 30	15 45	15.60	15.75	15.90	16.05	16.20	16 35	10
11	16 50	16 65	16 80	16.95	17 10	17.25	17.40	17.55	17.70	17.85	11
12	18 00	18.15	18.30	18 45	18.60	18 75	18.90	19.05	19.20	19 35	12
13	19 50	19 65	19.80	19.95	20.10	20.25	20 40	20.55	20.70	20.85	13
14	21.00	21 15	21.30	21.45	21 60	21.75	21.90	22 05	22 20	22 35	14
15	22 50	22 65	22 80	22 95	23.10	23.25	23.40	23.55	23.70	23.85	15
16	24.00	24 15	24 30	24 45	24 60	24.75	24 90	25 05	25.20	25.35	16
17	25.50	25 65	25.80	25 95	26.10	26 25	26 40	26.55	26.70	26.85	17
18	27.00	27 15	27.30	27 45	27.60	27.75	27.90	28.05	28 20	28.35	18
19	28 50	28 65	28 80	28.95	29.10	29.25	29 40	29.55	29.70	29.85	19
20	30 00	30 15	30.30	30.45	30.60	30.75	30.90	31.05	31.20	31.35	20
21	31 50	31 65	31.80	31.95	32 10	32 25	32.40	32.55	32 70	32 85	21
22	33 00	33 15	33 30	33 45	33.60	33 75	33.90	34.05	34.20	34.35	22
23	34 50	34 65	34.80	34.95	35.10	35 25	35 40	35.55	35.70	35 85	23
24	36.00	36 15	36.30	36 45	36.60	36.75	36.90	37.05	37 20	37.35	24
25	37.50	37.65	37 80	37.95	38.10	38.25	38.40	38.55	38.70	38.85	25
26	39 00	39 15	39.30	39 45	39 60	39.75	39.90	40.05	40.20	40.35	26
27	40 50	40 65	40 80	40.95	41.10	41.25	41 40	41.55	41.70	41.85	27
28	42 00	42 15	42.30	42.45	42.60	42 75	42.90	43.05	43.20	43.35	28
29	43 50	43 65	43.80	43 95	44.10	44 25	44 40	44.55	44.70	44 85	29
30	45 00	45 15	45.30	45 45	45.60	45.75	45 90	46.05	46 20	46.35	30
31	46.50	46.65	46.80	46 95	47.10	47.25	47.40	47.55	47 70	47.85	31
32	48 00	48.15	48.30	48 45	48.60	48 75	48.90	49.05	49 20	49.35	32
33	49.50	49 65	49.80	49.95	50.10	50.25	50.40	50.55	50 70	50.85	33
34	51 00	51.15	51.30	51.45	51.60	51.75	51 90	52.05	52.20	52.35	34
35	52 50	52.65	52.80	52.95	53.10	53.25	53.40	53.55	53.70	53.85	35
36	54 00	54 15	54.30	54 45	54.60	54.75	54.90	55.05	55.20	55.35	36
37	55 50	55 65	55.80	55 95	56.10	56.25	56.40	56.55	56.70	56.85	37
38	57.00	57.15	57 30	57 45	57.60	57 75	57.90	58.05	58.20	58 35	38
39	58 50	58.65	58 80	58 95	59.10	59 25	59.40	59 55	59.70	59.85	39
40	60 00	60 15	60 30	60 45	60 60	60.75	60 90	61.05	61 20	61.35	40
41	61.50	61 65	61 80	61 95	62 10	62 25	62.40	62 55	62 70	62.85	41
42	63 00	63.15	63 30	63 45	63 60	63 75	63 90	64 05	64 20	64.35	42
43	64.50	64 65	64 80	64.95	65.10	65 25	65 40	65.55	65.70	65.85	43
44	66 00	66 15	66 30	66.45	66.60	66 75	66.90	67.05	67.20	67.35	44
45	67 50	67 65	67 80	67 95	68.10	68.25	68.40	68.55	68.70	68.85	45
46	69 00	69 15	69 30	69.45	69.60	69.75	69.90	70.05	70.20	70.35	46
47	70 50	70 65	70 80	70 95	71.10	71.25	71 40	71.55	71.70	71.85	47
48	72.00	72 15	72.30	72.45	72.60	72.75	72.90	73 05	73.20	73 35	48
49	73 50	73 65	73.80	73.95	74.10	74.25	74.40	74.55	74.70	74.85	49
50	75.00	75.15	75.30	75.45	75.60	75.75	75.90	76.05	76.20	76.35	50

Computed by L. Leland Locke.

32.51
298+03.42
29.09

391.763
389.580
2.183

389.580
389.805
4.775

1.67
4
6.68
2
13.36

1.67
5
8.35
2
16.70
33.40

8.35
3
25.05

8.

392.76
90.97
1.79

1.67
4.5
835
668
7.515
3
22.545